

FINAL PHASE III RFI/RI WORK PLAN
ROCKY FLATS PLANT
881 HILLSIDE AREA, OPERABLE UNIT NO. 1
OCTOBER 1990

General Comments:

EPA submitted comments in October, 1990, on the Site-Wide Quality Assurance Project Plan (QAPjP) and the Standard Operating Procedures (SOPS) which together make the Sampling and Analysis Plan (SAP). The SAP comments should have been taken into account in generating the OU 1 Quality Assurance Addendum (QAA) document. A major concern is that the SAP did not adequately address the major QA procedures that will be employed at all the individual hazardous substance sites (IHSS). Much of the basic concepts were deferred to the site-specific QAA and the OU 1 QAA defers to the SAP. The QAA is designed to and must supplement the QAPjP where site-specific information is needed. The QAA provides site-specific information and should have been referenced in the Field Sampling Plan of the workplan. The QAA should state the accessibility of the SAP for worker instruction. These issues must be resolved to explain.

While the nature and extent of contamination section in Chapter 2 does provide summaries of contaminants in the different media, the section should have presented sufficient graphic representation of data in the form of tables, cross sections and plume maps. Even where insufficient data prevents detailed analysis (i.e. plume maps), chemical data could have been plotted along with hydrogeologic data to identify trends, correlations, and data gaps. Trend analyses are lacking. The data that have been collected for over three years at the site could have been used for trend analyses in characterizing the nature and extent of contamination. The information generated through implementation of this workplan must be presented to address this comment in the Phase III RFI/RI Report.

The approach in the revised workplan of evaluating the groundwater conditions by hydrologic unit rather than by SWMU is appropriate as contamination from the SWMUs is likely commingled. However, it is still necessary to define the type of contamination at each source for determining appropriate cleanup methods. It should be noted that the unconfined aquifer can be locally interconnected with the underlying sandstones. Thus,

contaminated groundwater from the surficial deposits can be transmitted to the underlying claystones and sandstones.

It is apparent that the Phase I and Phase II site evaluation investigations did not adequately characterize the site in terms of the soil, surface water and groundwater systems. The Phase III RFI/RI investigation must result in an accurate conceptual model of the hydrogeologic system in the vicinity of OU 1. The conceptual model should be developed for an area somewhat larger than OU 1 to account for the fact that physical earth systems are not limited by artificial boundaries.

A site conceptual model is lacking for development of the baseline risk assessment. The text describes a site conceptual model only in terms of geology and hydrology. In the context of the risk assessment, the model should include all media and be based on an analysis of potentially complete exposure pathways. In the RI workplan, the site conceptual model should have been evaluated for likely exposure points. These exposure points should have been considered when sampling and analysis plans were written. For several environmental contaminants, particle size may be important in determining exposure concentrations. Failure to examine appropriate particle sizes may result in under estimation of exposure concentrations. Sampling for extent of contamination over large areas provides little data for estimation of specific exposure point concentrations. If sampling is not extensive enough to detect a "hot spot", it may not be sufficient for estimation of exposure point concentrations in a residential setting where such a "hot spot" might impact 4 to 8 or more homes/living units. This comment needs to be addressed in order to develop an accurate assessment of risk for presentation within the Phase III RFI/RI Report.

A key element is missing from the description of activities for the baseline risk assessment. Before identifying chemicals of concern, a data evaluation step is critical. This step ensures that the risk assessment uses appropriate and reliable data, noting any data gaps or other data problems that contribute significantly to uncertainty. Of particular concern are quantification limits, uses and limitations of qualified data, evaluation of tentatively-identified compounds (if any), statistical analysis of background and increases over background, and representativeness of data. The data evaluation develops a subset of all the RI data which is to be used in the risk assessment. This data will then define the chemicals of concern and, if necessary, provide numerical criteria for reducing the number of chemicals of concern. This evaluation can also identify data necessary to support the risk assessment. This

comment needs to be addressed in order to insure that the workplan will provide the necessary data to support an accurate risk assessment.

The RFI/RI workplan should have addressed the possibility of archeological and historic sites on the plant site and OU 1. (Indian artifacts were found outside of the buffer zone along Rock Creek during Fall, 1990). Since the presence of archeological and historic sites may trigger additional ARARs, this issue must be addressed in the Phase III RFI/RI Report.

The workplan should have included an investigation of the retention pond located approximately 790 feet southeast of Bldg. 881 as shown in the October, 1964 air photos. It appears that the pond collected drainage from SWMUs 107 and 103. This issue must be resolved prior to submittal of the Phase III RFI/RI Report.

The response to comments (pages 1-1 and 3-1) indicates that supporting documents requested by EPA and CDH will be submitted under separate cover. These documents should have been submitted concurrently with the workplan.

At some point in the RI/FS process, remediation goals (i.e., cleanup levels) need to be established. With the exception of the "no action alternative", the alternatives scrutinized in the FS should be tailored to obtain those goals. The remediation goals should be based on both ARARs and on the baseline risk assessment. That is, the contaminants should be remediated such that their concentrations do not exceed any ARARs and do not pose a threat to human health or the environment. Since it is most appropriate for the remediation goals to be established at the conclusion of the RI phase (at the conclusion of the baseline risk assessment) or early in the FS phase, the RI/FS workplan should have defined a process which would be used to determine the process for identifying those remediation goals.

The document should have set forth the process whereby location specific ARARs would be identified. Potential location specific ARARs must be identified during the RI phase (see 40 CFR 300.430(d)(3)). Action specific ARARs need to be identified during the FS phase, as appropriate for a given remedial alternative.

There are still many uncertainties regarding appropriate background values for metal, radionuclides and major inorganic cations and anions for groundwater, surface water and soil. (Natural background concentrations of major ions may range over

two orders of magnitude. Natural background concentrations of metals and radionuclides are a function of the mineralogy of the sediments which comprise the unconsolidated deposits and bedrock which underlie the site.) Comparison of concentrations of metals, radionuclides and major ions to the estimated background levels should be done with caution and this comparison should not be the only factor used to decide if contamination has occurred. In light of the uncertainties, conservative assumptions must be used in the use of any background level unless the existence and genesis of the background level(s) can be substantiated.

Specific Comments:

Executive Summary: Preliminary results of the IM/IRA indicate the presence of toluene along the proposed french drain alignment. Follow-up testing has not been completed to verify the presence of toluene. The RFI/RI workplan fails to mention the possibility of toluene contamination. The workplan should have included information from the IM/IRA, and should have proposed investigations to determine nature and extent of toluene contamination. The Phase III RFI/RI Report must resolve this issue.

Figure 1-6: Indiana Street and Highway 128 should have been shown on the map as these are major roads which bound the buffer zone. As a general practice, scales should be included on all maps submitted to EPA.

Section 1.3.2.2 Surface Water Hydrology: The section should have been updated to reflect the past and present discharge practices in the Walnut and Woman Creek drainages.

Figure 1-2: The figure should have been updated to show the diversion structures in Woman and Walnut Creeks.

Section 1.3.2.3 Regional and Local Hydrology: The term descending can be misleading without qualification. The language should have been changed to "Geologic units at the Rocky Flats Plant, in order of descending age, are the.....".

Section 1.3.2.3 Rocky Flats Alluvium: The extent of the Rocky Flats Alluvium should have been shown (refer to figure 2-2). A cross section should have been added that illustrates eastward thinning of the Rocky Flats Alluvium.

Section 1.3.2.3 Arapahoe Formation: A cross section should have been presented to illustrate the geologic relationships between the units.

Section 1.3.2.3 Laramie Formation and Fox Hills Sandstone: The thickness of the upper claystone should have been provided. Structural controls can allow for penetration of contaminants to deeper units. The workplan should have accounted for this possibility, and the remedial investigation must include an assessment.

Section 1.3.2.4 Meteorology: The section should have been updated to reflect the current TRAC model studies. A conceptual model within the workplan should have included a detailed description of the air pathway so that likely exposure points could be identified and monitored. The specific air flow patterns at OU 1 must be addressed in the Phase III RFI/RI Report, as there are variations due to changing topography.

Section 1.3.2.6 Ecology: This section appeared incomplete. A description of the studies that were completed to reach the conclusions provided in this document should have been provided. The description should have included a list of the plant and animal life found in the area. The Environmental Evaluation Plan should have been referenced to show that further work will be undertaken. All conclusions reached and assumptions made in the Phase III RFI/RI Report must be substantiated either within the report or by reference.

Section 1.4.6 Hillside Oil Leak Site (IHSS Ref. No. 107): The workplan should have included all information regarding any sampling of the oil spill prior to removal to the present landfill. This information must be presented in the Phase III RFI/RI Report.

Section 1.4.9, Page 1-23. There are no provisions within the Phase III RFI/RI workplan to confirm the presumption that the 4-inch sewer line, an outfall pipe from Building 881, was indeed replaced. It seems prudent to perform a dye or smoke test to verify replacement. The Phase III RFI/RI Report must present information to resolve this issue.

Section 1.4.10 Building 885 Drum Storage Site (IHSS No. 177): The section should have referenced OU 10 which contains IHSS 177.

Section 2.1, Page 2-1, Paragraph 1: This section states four bedrock wells were installed during Phase I and Phase II activities. In contrast, Figure 2-1, which shows Phase I and II

monitoring well locations, indicates seven bedrock monitoring wells were installed. This discrepancy should have been corrected in this workplan and must be resolved in the Phase III RFI/RI Report.

Section 2.2.1.1 Surficial Geology: The text should have described the surficial deposits in greater detail (see CDH comments, p. 3-1).

The interpretation of the geometry of the gravel layers in the alluvium must be verified during the Phase III work. The data from Phase I and Phase II do not allow this interpretation to be made with certainty. It is very important that the existence of these gravel layers and the interpreted geometry be verified during the remedial investigation as the gravels may be preferred paths of contaminant transport.

The workplan should have discussed the origin of the north-south trending "swales" that "drain" Hillside 881, and/or should propose investigation of these swales if this is important to the conceptual model of the Hillside. The importance, impact and characterization of the swales, if appropriate, must be provided in the Phase III RFI/RI Report.

Figure 2-2: The map should have presented the location of all of the disturbed ground in SWMU 119.2.

Section 2.2.1.2 Bedrock Geology: The terminology "mild fracturing" should have been defined (see CDH comments, p.3-2).

Section 2.2.1.2 Claystones: The lithologic unit(s) in which the packer tests for well 5-87 were completed should have been stated. Information pertaining to the nature of the claystone and the depths of testing are necessary. Packer test information and results should have been provided for each well and must be provided in the Phase III RFI/RI Report.

What is the orientation of the 45 degree fracture identified in weathered claystone in well 8-87? The Phase III investigation must include looking for any fault traces or fractures in the surface and subsurface.

Section 2.2.1.2 Sandstones: Preliminary cross sections (north-south and west-east) should have been provided illustrating the relationships of the geologic units (surficial and bedrock), wells, boreholes and water levels described in the document. The specific data that allowed calculation of the mean hydraulic conductivity should have been provided in the workplan and must

be presented in the Phase III RFI/RI Report. The work and anticipated schedule pertaining to OU 1 in the high resolution seismic reflection program and plant-wide geologic characterization study should have been provided. These important studies must be incorporated while developing the Phase III RFI/RI Report.

The Phase I and II data indicate that the mean hydraulic conductivity of weathered claystone (7×10^{-7} cm/s) and weathered sandstone (3.9×10^{-7} cm/s) are about the same. The workplan should have explained this. The Phase III investigation must include more aquifer testing of the weathered claystone and weathered sandstone so that the Phase III RFI/RI Report can present this information.

Section 2.2.2.1 Unconfined Flow System: The text should have indicated that subcropping claystone is saturated locally. References should have included the page numbers. The data used to determine the vertical gradients should have been provided within the workplan and must be presented within the Phase III RFI/RI Report.

In section 2.2.2.1 it states that there is a strong downward gradient between groundwater in surficial materials and bedrock. The specific bedrock unit should have been stated.

Section 2.2.2.1 Groundwater Flow Directions: Well 47-87 is north of the Interceptor Ditch. Cross section 2-3 does not extend far enough south to include the south interceptor ditch. This does not support conclusions stated in the text. Additionally, the response to CDH comments (p. 3-2) indicates that the groundwater flows under the interceptor ditch. This inconsistency should have been corrected in the workplan and must be resolved prior to drafting the Phase III RFI/RI Report.

Figures 2-4, 2-5, 2-6 and 2-7: The water-level data show that well 55-87 is dry yet the 5850 contour interval is illustrated downgradient of the well. The water-level data show that well 47-87 is dry for all four quarters yet groundwater levels are plotted downgradient of the well. The figures in the workplan should have been corrected to illustrate the actual conditions. Well depth information should have been provided. An explanation for the 5950 contour interval loop around well 51-87 should have been provided. These inconsistencies must be resolved in the Phase III RFI/RI Report.

Section 2.2.2.1 Groundwater Flow Rates: The information from packer testing along the proposed french drain alignment designed for the IM/IRA should have been included in this workplan and must be included in the Phase III RFI/RI Report. Data collection was completed several months prior to submittal of this Phase III RFI/RI workplan.

Page 2-16 - It is stated here that well 47-87 was normally dry but some samples were obtained from this well. An explanation for this should have been presented. Were these samples collected after precipitation events? This question must be answered and presented within the Phase III RFI/RI Report.

Page 2-17 - With respect to the Woman Creek Alluvium, a hydraulic conductivity value of 1.5×10^{-3} cm/s is equal to 1552 ft/yr not 1035 ft/yr.

Page 2-18 - All of the mean hydraulic conductivity values for the various geologic units should have been included in a table for easy reference.

Section 2.2.2.2, Page 2-18, Paragraph 2: Hydraulic conductivities should have been provided for the Arapahoe Formation claystone. This information will be valuable in estimating the capability for water transport through claystone to the underlying sandstone and must be presented in the Phase III RFI/RI Report.

Section 2.2.3 Surface Water Hydrology: The section should have been updated to reflect the recent changes due to diversion of the drainages. Dates for the surface water measurements were not presented in this section nor referenced (see response to CDH comments p. 3-5).

Section 2.3.1 Background Characterization: Can temporal variations in water chemistry be determined prior to two years if more samples are taken? The text states that volatile organic compounds were not analyzed for background samples because the sample locations are potentially outside of contaminated areas. The response to CDH comments (p. 3-5) states that background samples will be collected and analyzed for VOCs. The RFI/RI workplan should have mentioned this in this section. Table 2-2 provides information regarding the background surface water tolerance interval upper limits or maximum detection values. The data is for Round 1, 7 samples. In the previous RI, the data was for Round 1, 9 samples and Round 2, 7 samples. The difference should have been explained in the workplan and must be resolved in the Phase III RFI/RI Report.

Table 2-3, Page 2-24: There are discrepancies between the units assigned to background data in the Draft Background Characterization Report (DBGCR) and the RFI/RI workplan. First, inorganic concentrations are given in milligrams per kilogram (mg/kg) in the DBGCR for soils, while the same are given in

milligrams per liter (mg/L) in the RFI/RI. In addition, radionuclide concentrations are presented in picocuries per gram (pCi/g) in the DBGCR and picocuries per liter (pCi/L) in the RFI/RI. This should have been corrected in the RFI/RI workplan showing inorganic data as mg/kg and radionuclide data as pCi/g and must be corrected in the Phase III RFI/RI Report.

Page 2-26: The units on several tables (e.g., Table 2-4) seem to be in error. Either the water concentrations are extraordinary (e.g., 25 g/L of aluminum in Table 2-4) or the denominator (L) is incorrect for the medium (soil).

Section 2.3.2 Soils: The data should have been presented even though unvalidated. The validation of OU 1 sample results should be a priority as the workplan will need to be amended if unexpected results are present. Table 2-5 does not include cesium and molybdenum as sampling parameters. These parameters should have been added to the list.

Section 2.3.2.1 Volatile Organic Compounds: The occurrence of toluene in the borehole samples collected along the proposed drain alignment needs to be addressed. The last sentence on page 2-28 continued on page 2-37 is incomplete and should have been corrected. Table 2-6 should have included the contaminant encountered for the direct hit samples. The description in the text should have mentioned the direct hit at borehole 63-87. These issues must be addressed in the Phase III RFI/RI Report.

Section 2.3.2, Page 2-28: A discussion of semivolatile organic compound (SVOC) soil contamination should have been provided in this section which addresses analytical results from Phase I and II investigations. These contaminants will be important to the calculation of risk at OU 1.

Section 2.3.2.3 Radionuclides: Table 2-7 should have specified the sample depth intervals. The ratios of U233 + U234 to U238 and of U235 to U238 should have been presented in Table 2-8 (see PRC comments, p. 2-3). Is it possible to conclude preliminarily that the uranium ratios for samples 1-15 are greater than one when dilution from compositing over several feet is possible? Cross sections DO NOT always need to show trends but should display the data. It is extremely helpful to display the data graphically for evaluation purposes. This information must be presented within the Phase III RFI/RI Report.

Section 2.3.2.3, Page 2-38: No data should be discarded from further consideration if, by adding the tolerance level (since it is a plus as well as a minus tolerance), the concentration is

pushed above applicable or relevant and appropriate requirements (ARARs), maximum contaminant levels (MCLs), or both. As even though they meet ARARs.

Section 2.3.3 Groundwater: Well 1-87 water and contaminant data may also indicate another source of contamination and may not indicate that the well is sidegradient. This must be verified through development of the Phase III RFI/RI Report. Of the three wells listed as being dry during all sampling attempts, two of the wells, 51-87 and 54-87 are shown to have sample results (see figure 2-10). Of the 14 wells listed as being downgradient from the "eastern" SWMUs, well 55-87 is shown to have sample results (see figure 2-10). The figure should have been consistent with the text and Appendix B.

On page 2-42 it is stated that unweathered bedrock is considered part of the confined flow system. A discussion should have been presented to clarify why if the bedrock is unweathered that groundwater is contained under confined conditions. Storage coefficient values obtained from aquifer tests in unweathered bedrock should be used to verify confined conditions. A discussion of SVOC groundwater contamination is not, and should have been, presented in this section which addresses analytical results from Phase I and II investigations. This information must be presented in the Phase III RFI/RI Report.

Page 2-43 - Why were monitoring wells 51-87, 54-87, 58-86, 63-86, 44-87, 49-87, 50-87 and 55-87 always dry? This should have been explained at least preliminarily, and may be important to the conceptual model. Was the entire thickness of colluvium dry or were the well screens improperly located?

Section 2.3.3.1 Volatile Organic Compounds

Unconfined Groundwater: The text should have described the TCE and PCE contamination at well 51-87 as shown on Figure 2-9. The toluene occurrences are not minor as the text implies. Table 2-10 shows toluene present at 270 ug/l for well 43-87 and 81 ug/l for well 9-74.

Table 2-10, Page 2-47: Units should have been presented for organic data on the second page in Table 2-10, which lists VOCs detected in unconfined groundwater. These data should have been represented in micrograms per liter (ug/L).

This data and data from borehole samples from the OU 1 IM/IRA indicate toluene contamination. The remedial investigation needs

to address this. Acetone and methylene chloride occur in a significant number of wells in concentrations one to three orders of magnitude greater than in blanks. Acetone, methylene chloride and other possible lab contaminants should presently be considered as potential contaminants. The remedial investigation must resolve this issue.

The concentration plots for TCE and PCE are useful in evaluating the nature and extent of contamination. Plots of the other contaminants present should have also been presented in the workplan and must be present in the Phase III RFI/RI Report.

It is not clear what high matrix noise is (see response to EPA comments, p. 1-7) and the affect this will have on obtaining quality data from which characterization of contamination can be accomplished. Detection limits should not be set so high that low levels of contamination are masked. The response should clearly present what is well above low-level contract-required detection limits and/or well above CLP-accepted levels for common laboratory contaminants.

Confined Groundwater: Data should be graphically displayed and in tabular form for the unconfined groundwater conditions. The data indicate that a potential for contamination is present in the sandstones. TCE was detected at concentrations exceeding the Colorado Department of Health Basic Standards for Ground Water (CDH, September 30, 1989) in wells 3-87 (6 ug/l) and 8-87 (35 ug/l). Also, carbon tetrachloride greatly exceeded the CDH standard in well 8-87 (130 ug/l) on one occasion. The conclusion reached in the RFI/RI workplan stating that groundwater in the unweathered sandstone is not contaminated is premature as the extent of contamination is not yet adequately characterized. This question must be answered through implementation of the remedial investigation.

Page 2-53 - Time versus concentration graphs should have been prepared for all or a select set of wells from all geologic units. Parameters to be graphed should have included representative analytes from each of the major groups of analytes - ie, metals, radionuclides, organics and major ions. Temporal trends must be presented and explained in the Phase III RFI/RI Report.

Page 2-53 - The conclusion that the groundwater in the unweathered sandstone is not contaminated cannot be stated with certainty in light of the analytical results from well 8-87. The Phase III investigation should look more closely at well 8-87. This question must be answered through implementation of the remedial investigation.

Trilinear diagrams or stiff diagrams should have been plotted up for groundwater in each of the geologic units. Background data could be used for this. Construction of the diagrams would allow comparison of groundwater in various geologic units. Such a comparison is important in the development and presentation of a conceptual model and must be performed during the remedial investigation.

Section 2.3.3.2 Major Ions in Unconfined Groundwater: The text describes the maximum concentrations for major ions but these values are not graphically displayed in figures 2-11 and 2-12. The figures present second quarter 1989 data for comparative purposes with sample data from the background investigation. This indicates the need to perform trend analyses. The figures, as they are presented, are misleading. The elevated TDS concentrations at well 43-87 are not specifically described in the text (see response to FRC comments, p. 2-5).

Section 2.3.3.3 Summary of Extent of Contamination: The conjecture that organic contamination is restricted to a small area around Individual Hazardous Substance Site (IHSS) 119.1, one of the multiple solvent spill sites, is not supported. To the contrary, VOC contamination has been detected in Wells 0687 and 6486 at 20 parts per billion (ppb) trichloroethene (TCE) and 87 ppb tetrachloroethene (PCE), respectively. Wells 0687 and 6486 are approximately 150 feet and 700 feet downgradient of IHSS, respectively. In addition, many of the wells downgradient of IHSS 119.1 have been dry during previous sampling events. Although dry conditions inhibit contaminant migration, the lack of groundwater data from these wells provides little indication of the extent of contaminant transport in the alluvium downgradient of IHSS 119.1. No conclusions regarding the extent of contamination from IHSS 119.1 can be made based on the data provided in the RFI/RI workplan. Slugs of contamination could have been released periodically and their detection could be missed due to sampling frequency or well location. The number of bedrock wells is insufficient to determine the vertical extent of contamination. The workplan should have been designed to verify these presently unsupportable conclusions and the Phase III RFI/RI Report must resolve these issues.

Section 2.3.4 Surface Water: The Phase III RFI/RI Report must reflect the recent diversion structures from pond C-2. Background values and the surface water results should have been presented in a table for evaluation and must be presented in the Phase III RFI/RI Report.

Section 2.3.4.1 South Interceptor Ditch: The contaminants found in surface water should have been compared to those found in the groundwater, sediments and soils. The Phase III RFI/RI Report must do this. It is important to correlate the sample results, if possible, in determining contaminant sources and means of migration. Results of the borehole samples collected under the IM/IRA should have been presented or referenced and must be presented in the Phase III RFI/RI Report. Toluene was detected potentially in the IM/IRA borehole samples and may be related to that found in the sample from SW-69. It should have been noted at which sample locations dissolved gross alpha and beta, uranium and plutonium exceeded background. This information must be presented in the Phase III RFI/RI Report.

Section 2.3.5 Sediments: The sample locations should have been shown on a map. Figure 2-17 does not show the sediment sampling locations (see also response to EPA and CDH comments). The sampling locations must be presented in the Phase III RFI/RI Report. Results of sediment sampling should have been compared with surface water, groundwater and soil sampling results. This must be done in the Phase III RFI/RI Report. The question arises once again about whether the low levels of certain volatile organic compounds in the samples represent contamination especially if present in blanks. Until it can be demonstrated that the presence of these contaminants is due to lab contamination, they should be considered present. Additionally, not all the volatiles sampled for were in low concentrations.

Background values and sediment results should have been presented in a table. This must be done in the Phase III RFI/RI Report.

Section 2.3.6: The air monitors in the IM/IRA construction site should have been added to this section of the workplan and included in the location map. A map showing the location of the air monitors is necessary and must be presented in the Phase III RFI/RI Report.

Section 2.4 Applicable or Relevant and Appropriate Requirements: The units for VOCs in Table 2-11 should have been ug/l and not mg/l. Detection limits for Cs and Li were 1 and 0.1 mg/l and not changed to .1 and .01 mg/l (see EPA comments). There is a discrepancy between the lab data and the detection limits (the recorded concentration is less than the detection limit and not noted as such). GC is not applicable to metals and inorganics. These corrections must be made in the Phase III RFI/RI Report.

Organic concentrations should be represented in ug/l.

Page 2-72: This section does not contain a discussion of location-specific or action-specific ARARs. In addition, chemical-specific ARARs for soil, sediment, and air media are not given. At a minimum, the RFI/RI workplan should have stated these additional ARARs will be identified and reference the submittal (for example, the Feasibility Study Report) that will contain the discussion. These issues must be resolved in the Phase III RFI/RI Report.

The discussion of "RCRA Subpart F concentration limits" as ARARs is unclear. The intention apparently was to identify the maximum groundwater concentrations specified in 40 CFR 264.94 as relevant and appropriate requirements. These are not "RCRA Subpart F regulations." RCRA Subpart F is an inappropriate citation and should not have been used to reference the Code of Federal Regulations. This must be corrected in the Phase III RFI/RI Report.

Pg. 2-74: The ARAR reference should have included citations. Greater discussion of LDR ARARs was needed. In addition, DOE should have presented in table format all potential ARARs associated with a contaminant. (Note: Unlike the OU 2 IM/IRA Decision Document, the concept of "potential ARARs" is appropriate here since we are only in the RFI/RI workplan stage. It is the RI which transforms potential ARARs into actual ARARs for use in identifying and assessing remedial alternatives.) These corrections must be made in the Phase III RFI/RI Report.

The table cites RCRA Subpart F as the ARAR reference for 1,1-dichloroethane, methylene chloride, and carbon disulfide. These constituents are not specifically cited in 40 CFR 264.94. The RFI/RI workplan should have clarified this reference. In addition, land disposal restrictions (LDRs) are cited as the ARAR reference for acetone. A discussion should have been provided regarding LDRs and whether they are applicable or relevant and appropriate to the site. These comments must be addressed in the Phase III RFI/RI Report.

Page 2-80: Since the RCRA Groundwater Protection Standards should be either applicable or relevant and appropriate, it is erroneous to classify background concentrations for cesium and strontium as "TBC". The appropriate RCRA Groundwater Protection Standard ARAR is either ACL or background. However, the cleanup requirements established during the RI/FS process is analogous to the RCRA process to determine ACLs and obviates the need to consider background concentrations as the cleanup standards. Therefore, the sentence classifying background concentration as a "TBC" should have been deleted and the following inserted: "The cleanup levels for these contaminants, as with all other contaminants, will be established upon the conclusion of the Baseline Risk Assessment described in Section 4.6.1." This comment must be addressed in the Phase III RFI/RI Report.

Section 2.5, Sampling and Analysis Requirements for Remedial Alternatives Evaluation: Table 2-13 should have included coagulation and precipitation technologies for groundwater and surface water treatment (see PRC comments p. 2-8). The Phase III RFI/RI Report must address these technologies.

Section 3.1 Phase I and II RI Conclusions: There is indication that soil contamination is present at 14-87, 61-87 and 63-87 in addition to 1-87, 57-87 and 58-87. This should have been presented and discussed and this issue must be resolved in the Phase III RFI/RI Report.

Page 3-2, Sec. 3.1, Item 5 - Ground-water recharge also occurs via movement of water from one aquifer or hydrogeologic unit to another aquifer or hydrogeologic unit. The impact of such recharge must be assessed during the remedial investigation.

Section 3.2 Site-Specific Phase III RFI/RI Objectives and Activities: The site-specific QAA should have been mentioned in this section.

Section 3.2 Table 3-1: The site-wide geologic and geophysics study activities should be tied into the Characterize Site Physical Features Objective and must be acknowledged in the Phase III RFI/RI Report. Use of the Rocky Flats Environmental Database System (RFEDS) for data evaluation should have been included into the objective of Characterizing the Nature and Extent of Contamination. A QA/QC objective should have been included. Three additional objectives; identifying IM/IRAs for OU 1, identifying and implementing data management procedures, and identifying upgrades to the air monitoring system should have been included in this section and section 4.1.3 (see CDH comments, p.3-10).

Page 3-4, Table 3-1 - Phase III RFI/RI objectives should have included the development of a conceptual hydrogeologic model for the area around Hillside 881 (not a numerical model). This should have included a subsurface geologic model and a hydrologic model. These objectives must be achieved and presented in the Phase III RFI/RI Report.

Page 3-5 - Preliminary plume maps for contaminants of concern should have been prepared in the vicinity of all IHSSs. Consideration should have been given to fate and transport modeling. Verified plume maps must be presented in the Phase III RFI/RI Report.

Section 4.1.1 Task 1 - Project Planning: The site-specific QAA should have been referenced. The site-specific Health and Safety Plan and the Standard Operating Procedure Amendments should have been submitted as appropriate. The QAPjP and the SOPs (which together are the Sampling and Analysis Plan or SAP) submitted by DOE were reviewed by the regulatory agencies. Those comments should have been reviewed in conjunction with activities for the OU 1 RFI/RI. A major concern is that the SAP deferred the details to the site-specific plans and the GRRASP and the site-specific plans and the GRRASP have not been submitted. The GRRASP is referenced in this document as are the site-wide SOPs for defining the analytical scope of work. The GRRASP should have been submitted for review or the QAPjP should have been revised to include the pertinent information of the GRRASP. This issue must be resolved prior to approval of this workplan.

Section 4.1.2 - Task 2 Community Relations: Site-specific community relations plans are not required for submittal. The interim community relations plan is supposed to cover community relation activities until the final Community Relations Plan is completed. The Interim Plan was not implemented in November, 1990.

Section 4.1.5 Task 5 - Data Evaluation: The RFEDS database should have been specifically referenced and the methods of evaluation should have been explained. This information must be provided within the Phase III RFI/RI Report.

Section 4.1.5.1 Site Characterization: The site-wide geology and geophysics studies should have been referenced and must be utilized in developing the Phase III RFI/RI Report.

Section 4.1.5.2 Source Characterization: The analytical data from the source boreholes must also be used to determine risk information important to development of the Phase III RFI/RI Report.

Section 4.1.5.3 Nature and Extent of Contamination: The extent of contamination should also have been depicted in cross sections. This must be presented in the Phase III RFI/RI Report. The technique of principal component analysis for identifying the releases from different sources should have been explained, and must be explained in the Phase III RFI/RI Report. Hydrogeologic information data along with the chemical data should have been used to investigate the movement of contaminants from one pathway to another. This must be evaluated in the Phase III RFI/RI Report. Nature and extent of contamination via the air pathway should have also been addressed and must also be evaluated in the Phase III RFI/RI Report.

Page 4-5 - Using kriging to contour isopleths generally does not produce accurate plume maps. Be aware of the many limitations of kriging.

Section 4.1.6 - Task 6 - Baseline Risk Assessment: Page 4-7: The Endangerment Assessment Handbook has been superceded and should no longer be used.

Section 4.1.6.1 Contaminant Identification: The text states all chemicals detected above background concentrations will be treated as site contaminants for the public health evaluation. The method for determining "above background" should have been discussed and must be discussed in the context of the Phase III RFI/RI Report.

Public Health Evaluation Contaminant Identification: As stated in EPA's previous comments (see p. 1-12), chemicals must not be eliminated from further consideration until the exposure assessment phase of the baseline risk assessment is completed. Comparison of site contaminants to ARARs and toxicological summaries is very important (see response to CDH comments, p. 3-12). It is also necessary to attempt to evaluate the data in terms of synergistic effects and evaluate the data in terms of additive effects. Therefore, prior to dropping a chemical for further consideration, the toxicological, synergistic and additive effects must be investigated. This investigation and the results thereof must be presented in the Phase III RFI/RI Report.

Exposure Assessment: Exposure pathways presented in the workplan should have included evaluation of transfer of contaminants from one medium to another. Onsite workers are receptors who should be considered. These factors must be evaluated in the context of the Phase III RFI/RI Report.

Toxicity Assessment: Page 4-11: The term "cancer potency factor" has been replaced by the term "slope factor" in all superfund guidance.

Section 4.1.6.2 Environmental Evaluation: The Guidance for Data Useability in Risk Assessment (EPA/540/G-90/008) should have been used for guidance in planning the environmental evaluation. The discussion of the biological field surveys is not consistent with the program described in Section 6. This discussion should have reflected the actual information to be obtained from that program. The upper reaches of Woman Creek that will be used as a reference area for comparison with site results should have been defined. This area must be upgradient from all known sites of contamination and must not be affected by wind-blown

contaminants. The text repeats a paragraph on pages 4-13 and 4-14. These issues must be addressed in order to develop the Phase III RFI/RI Report.

Section 4.1.7 Task 7 - Treatability Studies/Pilot Testing: EPA comments, which will be submitted December 20, 1990 regarding the Treatability Study Plan (TSP) should be considered. The TSP submitted did not provide comprehensive plans for treatability studies and did not provide information regarding innovative technologies. The treatability activities related to OU 1 need not be delayed to await the results of the site-wide treatability studies. Table 4-2 should have identified technologies for groundwater and surface water remedial evaluation.

Section 4.1.8 Task 8 - Remedial Investigation Report: The Phase III RFI/RI Report must contain graphical representations of data (i.e. cross sections). Trend analyses must also be provided.

Pg. 4-16 The Phase III RFI/RI Report must also include the following:

- Identification of ARARs (chemical specific and action specific).
- Identification of remediation goals, (i.e., the goal is not to meet only the ARARs, but also the risk assessment levels).

A discussion of these activities should have been included in the workplan.

The Phase III RFI/RI Report must contain a thorough discussion of the bedrock geology and an evaluation of contamination within the bedrock.

Section 4.2.1 Task 9 - Remedial Alternatives Development and Screening: Land ban requirements must also be met during the cleanup process.

Section 4.2.3 - Page 4-24: The Feasibility Study must 1) summarize ARARs identified in the RI, 2) discuss the remediation goals, and 3) identify action and location specific ARARs that bear on the alternatives analyzed in the FS.

Section 5 Phase III RFI/RI Field Sampling Plan: The field operations are presented in the Site-Wide Sampling and Analysis Plan which includes the QAPjP and the SOPs. The SAP refers to site-specific quality assurance plans and SOPs which should have

been presented here and not referred to the 1989 Operational Safety Analysis document. This paragraph states that precautions may include the containerization of drill cuttings and/or groundwater removed during RFI/RI field activities. Containerization of collected groundwater and drill cuttings is not optional, but must follow the approved SOPs.

Section 5.1 Source Characterization: The SOP (1990) deferred site-specific information to the workplans. The individual OU 1 workplan is referencing the SOP. The site-specific information should have been added if it differs from the SOPs. In new boreholes and wells where contamination is found, additional drilling will be necessary to determine the vertical extent of the contamination. For example, if contamination is found in the surficial deposits, additional characterization will be necessary to determine if the contamination has progressed farther down. Bedrock wells must be installed where borehole sampling indicates bedrock is contaminated (see EPA comments, p. 1-14). These issues must be resolved to develop an acceptable Phase III RFI/RI Report.

Section 5.1.1.3 Liquid Dumping Site (SWMU Ref. No. 104): A monitoring well will need to be installed if samples from the boreholes indicate contamination. If contamination is found, the remedial investigation will need to fully characterize it.

Section 5.1.1.4 Out-of-Service Fuel Oil Tanks (IHSS No.s 105.1 and 105.2): This should have been clarified. Remedial alternatives regarding the underground storage tank removal should be addressed in the FS.

Section 5.1.1.6 Hillside Oil Leak Site (IHSS Ref. No. 107): Monitoring well MW17 may need to be moved slightly southward to detect groundwater flowing from under the skimming pond. Groundwater level data will need to be evaluated more precisely to determine the best location for MW17.

Section 5.1.1.8 Radioactive Site No. 1-800 Area (IHSS Ref. No. 130): The workplan should have stated the need for careful sampling at this IHSS (see EPA comments, p. 1-15).

Section 5.1.1.7 Multiple Solvent Spill Sites (IHSS Ref. Nos. 119.1 and 119.2): Proposed well MW23 is not located downgradient of IHSS 119.2 as stated in the response to CDH comments (p. 3-14). Well MW29 will monitor groundwater flowing under IHSS 119.1 and not 119.2 as stated in the response to CDH comments (p. 3-14). The potentiometric surface data should be used to locate well MW25 so that it is downgradient from well 43-87 as

contaminants were detected in this well. Soil contamination is indicated at BH15-87 and possibly BH61-87 which require follow-up investigation of soil and groundwater. These issues must be addressed in order to present an acceptable Phase III RFI/RI Report.

Section 5.1.2.1 Chemical Analysis of Soil Samples: Procedures should have been identified and not referred to the GRRASP as the GRRASP was not provided for review with the Sampling and Analysis Plan. Therefore, it is not certain what the procedures are. The procedures should be those defined in the Sampling and Analysis Plan and the site-specific plan. EPA comments on the SAP apply to this document as well. This issue must be resolved prior to approval of this workplan.

Section 5.1.2.2 Soil Blanks: The investigation of sample contamination should be ongoing in order to get quality data for evaluation. This issue could precipitate conservative decisions later on in the decision-making process for OU 1. In order to prevent this, DOE must address this issue and resolve it during the Phase III RFI/RI.

Section 5.2.1.1 Monitor Well Locations: The location of well MW29 is not downgradient of the majority of SWMU 130 (see response to EPA comments, p.1-1). An additional well, located between MW34 and MW35 and near well 55-87, in the Woman Creek Valley Fill is necessary for the characterization described in the section. This location is downgradient from IHSSs 130 and 119.1 (see potentiometric surface map). The seismic study should have been referenced in this section as stated in response to CDH comments (p. 3-15).

Section 5.2.1.2 Chemical Analysis of Ground-Water Samples: The sample and analyses procedures used must be those described in the approved site-wide SOPs. If additions or changes to the SOPs are necessary for this workplan, then these items should have been addressed specifically. The SOPs should have been referenced here (with page numbers). It is not necessary to describe the SOP procedures in this section.

Section 5.2.1.3 Hydraulic Testing: An explanation of how the pumping tests in Woman Creek Alluvium will provide the necessary information to determine hydraulic conductivity for all the geologic materials in the 881 Hillside area should have been presented within the workplan (see CDH comment, p. 3-15). The workplan should have explained the selection of locations for the three pumping wells located in Figure 5-2. This discussion is necessary within the text of the Phase III RFI/RI Report.

Page 5-22 - It is stated here that the hydraulic conductivity and effective porosity of the Woman Creek Alluvium are known to estimated accuracies of a factor of three and that dispersivity is known to an estimated accuracy of an order of magnitude. This should have been explained within the workplan, including an explanation of how these accuracies were determined. This information must be substantiated and presented in the Phase III RFI/RI Report. The hydraulic conductivity value derived from Phase I and II for Woman Creek (1×10^{-3} cm/s) seems low based on the lithologic description of the Alluvium.

Page 5-25 - An explanation of why multiple well aquifer tests are planned only for the Woman Creek Alluvium should have been provided. EPA recommends multiple well aquifer tests for the colluvium, the Rocky Flats alluvium and the Arapahoe Formation.

Section 5.2.2.1 Surface Water and Sediments - Sample Locations: The sediment sample locations should have been shown in Figure 2-17 (see response to EPA comment, p. 1-17).

Section 5.2.3 Surficial Soils: Approved procedures in the Plan for the Prevention of Contaminant Dispersion must be employed during the surface and subsurface sampling. Surface scrape locations 1,2,3,6,10,11,12,13,16,17,18 and 19 (Table 2-8) all indicate elevated uranium and plutonium. This signifies the need to collect samples on a denser grid, and in, and adjacent to IHSSs, more than proposed in the workplan. The lack of this information may force DOE to make conservative judgments regarding contamination which may overestimate the actual risk.

Section 5.3 Evaluation of the Proposed Interim Remedial Action: Hydrogeologic information was obtained through packer testing. The locations of the six boreholes not along the 100-foot centers should have been identified in the workplan and must be presented in the Phase III RFI/RI Report. Piezometers should also be located west of the recovery well location.

The method of sampling along the influent/effluent pipeline alignment for the IM/IRA results in compositing over 5 ft. intervals. This will cause significant dilution of potential contaminants and potentially non-representative samples. The criteria for choosing the discrete VOC soil sample should have been provided with the workplan. The methods described do not indicate that they are adequate to determine the appropriate health and safety protocol. This information must be presented in the Phase III RFI/RI Report.

Results of the packer tests and sample analyses should have been provided and summarized within the workplan and must be presented within the Phase III RFI/RI Report.

Section 6.1 - Introduction: There is no reason to exclude contaminants because of lack of specific data on ecological impacts. At worst, structure activity relationships, known toxicity in non-target species and/or basic physical/chemical properties provide a basis for qualitative discussion of potential ecologic impact. Further, although the RFI/RI should not be a basic research project in itself, DOE efforts as a whole need to be cognizant of information gaps so that research funds can be allocated appropriately. Thus, identification of potential, but poorly studied, contaminants could be significant outside of the Region VIII Superfund process.

Section 6.1.2., 881 Hillside Contamination: Toluene also seems to be a contaminant present in soil as indicated by sample results from the IM/IRA french drain alignment activities. Other possible contaminants in soil are: 2-butanone, pyrenes and benzenes. The ecological hazard to biota caused by inhalation of plutonium should be reviewed in addition to the hazard caused by ingestion (see p. 6-5). The text states plutonium is not considered an ecological hazard to biota "unless extremely high levels (> 1 microCurie per square meter (Ci/M^2)) occur." It is not clear whether microcurie (μCi) or millicurie (mCi) are meant. The report that this statement was taken from is identified, but the basis for the statement is not. The assessment of impacts in the RFI/RI workplan should have discussed the rationale behind the determination of little effect related to a possible constituent of Rocky Flats soils responsible for a great deal of public concern. This position must be justified within the context of the Phase III RFI/RI Report.

Section 6.1.3 Protected Wildlife, Vegetation and Habitats - Vegetation: The ten federally-listed or proposed plant species should have been listed in the evaluation within the workplan and must be considered during the Phase III RFI/RI.

Section 6.1.4 Scope of Work: The natural resources are not ARARs. ARARs are used along with risk levels to determine levels of cleanup to meet protectiveness standards.

Section 6.2.1 Preliminary Planning: The plans should have taken into account the schedules for OU 1 activities (RFI/RI and IM/IRA) as presented in the IAG to meet the needs of the investigations. The determination as to what constitutes a statistically significant difference in the biological response

between tissue samples is not identified in the QAPjP. The environmental evaluation section is missing in the QAPjP. This issue must be rectified prior to approval of this workplan.

Section 6.2.3 Support Documentation: The field sampling plan must be consistent with that provided for the Site-Wide SAP. If specific conditions exist for OU 1, then these should have been identified. Procedures that will be used generally should be presented in the SAP. This problem must be resolved prior to approval of this workplan.

Section 6.2.4 Review of Existing Information: Any information generated from the RFI/RI and IM/IRA studies should have been reviewed.

Section 6.3 Field Investigation (Stage 1): Sediment information must be collected per requirements listed on page 6-9. The SOPs related to the particular field activity should have been identified.

Section 6.3.2 Soils: The chemical/hydrologic/geologic model for the 881 Hillside is not well defined at this time. The Phase III investigation must provide the additional information necessary to develop an overall conceptual model.

Section 6.3.4 Groundwater: The hydrogeologic information and laboratory analytical results from the Phase III investigation program are an integral part of the environmental assessment and must be included. The remedial investigation must evaluate the effects of contaminated groundwater regardless of the depth.

Section 6.3.5.1 Vegetation: The workplan states that the criteria will be determined for the selection of key species. The criteria should have been identified in the workplan. At the very least, the method for determining the criteria should have been mentioned. The workplan should have identified any protected species. This issue must be addressed and justification presented within the Phase III RFI/RI Workplan.

Section 6.3.5.2 Wildlife: The text identifies benthic macroinvertebrates as probably existing as soft bottom communities in Woman Creek and Pond C-2. The reason for the apparent elimination of harder-bottom communities in Woman Creek is unclear, especially because the later inclusion of Surfer sampling methods indicates finding something other than soft bottom habitats (riffle habitats discussed page 6-40). The discussion should have been written to concur with the rest of the section, or the rest of the section qualified for the

unlikely of finding aquatic habitat other than those related to soft bottoms. It should be noted that if the stream bottom is in fact made up only of soft sediments, the plan to walk through it while electroshocking will probably make the water too turbid to see any stunned fish. If this is the case, an alternative method should have been proposed. This issue must be resolved prior to conducting the environmental evaluation field work so as to prevent a problem within the Phase III RFI/RI Report.

Section 6.4.2 Contaminant Identification: The chemical list used in the evaluation must be comprehensive.

Section 6.5.2 Toxicity Tests: The text states in-situ methods of toxicity testing involve the exposure of "animals in the field to existing aquatic or soil conditions." It is not clear whether laboratory animals will be exposed to these conditions or whether animals that already live in the ecosystem will be exposed to existing conditions. The discussion should have been clarified and more detail provided. The resolution to this issue must be justified and presented within the Phase III RFI/RI Report.

The table identifies exposure points as air, soil, water, and vegetation, but identifies exposure point concentration related to soil and sediment, surface water, groundwater, and vegetation. Exposure pathways are identified as terrestrial and freshwater. On page 6-29, terrestrial and aquatic ecosystems are identified. As an outline for the environmental evaluation, the same terms and topics should have been used for discussions which are related to each other to reduce the possibility of future confusion. This must be resolved and clearly presented within the Phase III RFI/RI Report.

Section 6.7 Environmental Evaluation Report: Section 7 in the draft environmental report outline must include Woman Creek in the freshwater pathway analysis. The stage I sampling plan may be modified with EPA approval.

Section 6.8.2.2 Locations for Periphyton Sampling: The text states the absence of periphyton at any location will result in sampling of periphyton at the nearest downstream location. The method for determining the presence or absence of periphyton is not identified and must be clear before conducting the field work. It is unlikely that a visual review of site conditions will adequately identify the absence of periphyton in any situation other than the absence of water. The procedure to be used should have been identified and must be before entering the field. If that procedure is expected to be visual, the text should have stated this. This problem must be addressed,

resolved and presented within the text of the Phase III RFI/RI Report.

Section 6.8.4.4 Macrobenthos: The text states that samples will be placed in plastic jars and reference specimens preserved "in a 70 percent isopropanol solution." It was not clear whether the samples themselves will be preserved. It is unlikely that use of an alcohol solution that starts at 70 percent will be adequate to preserve macroinvertebrate samples. The final solution should be 70 percent for preservation. It should also be noted that the list of equipment on page 6-45 includes 70 percent ethanol rather than isopropanol. The methods and text should have been revised and this issue must be resolved prior to conducting the field work.

Section 6.8.4.5 Fish: Established criteria to determine the number of passes that define "multiple" should have been presented. The text should have discussed the specific number of passes expected for each location. This must be justified and presented within the Phase III RFI/RI Report.

Section 6.8.5 Stage III - The text should have stated the expectation for the sampling program to provide the necessary amounts of biomass.

Appendix B: Data from several 1989 and early 1990 sampling events have not been received by DOE. An explanation of why data is not available for these samples should have been provided. This data must be utilized to develop the Phase III RFI/RI Report.

Soil concentrations in parts per billion reported for BH13-87 indicate methylene chloride concentrations of 27B and acetone concentrations of 15(JB). On a later page for the same surficial unit, the concentrations are 27.9 methylene chloride and 22 acetone. There appears to be a discrepancy in the data which should have been explained. Detection limits appear to be high and possibly are masking low levels of contaminants.

The cover sheet for Appendix B groundwater wells refers to OU 2 instead of OU 1.

Quality Assurance Addendum Comments

Section 3.1 Data Quality Objectives: Table 1 - Characterize the nature and extent of contamination, item 1, should have addressed the extent of surficial radionuclide soil contamination due to

release from the IHSS not just from wind dispersion. This table should have been merged with Table 3-1, in the workplan. It is not clear why this information is repeated in the QAA. The text states that only precision and accuracy can be expressed in purely quantitative terms of the five data quality parameters. Completeness is also a quantitative evaluation and should have been added to the statement.

Precision and Accuracy: Any non CLP protocols used must be approved by EPA prior to implementation. Table 2 should have given the analytical procedure for all types of analyses.

Section 3.2 Sampling Locations: The entire discussion of the environmental evaluation does not agree with that presented in Section 6 of the Phase II RFI/RI workplan. The inconsistencies include discussions of timeframes, sample locations, and discussions of procedures. This document and the workplan should have been reviewed side by side, and revised for concurrence. As they currently exist, they do not seem to discuss the same program. Information on sample locations should have been included in the field sampling plan within the workplan. This issue must be resolved to EPA's satisfaction prior to approval of this workplan.

Section 3.7 Quality Control Checks: Lab contamination has been cited as a likely reason for elevated concentrations of acetone, methylene chloride, phthalate, toluene and other chemicals in the environmental samples. Verification of this is necessary. The outcome of this analysis could impact the risk assessment Phase III RFI/RI Report and ultimately the cleanup decision. The means of verifying and preventing any future contamination should have been fully described. The reference used to determine the 30 percent and 40 percent relative percent difference for field duplicate samples should have been given. The percentages may vary with the analytical method. Field matrix spikes and matrix spike duplicates are necessary and the numbers of each should have been identified. The compounds and the concentrations used to prepare the spikes should have been identified. Table 4 lists the QC sample collection frequency but also should have listed the number of samples to be taken based on the workplan.

Data Validation: The QAA lists a number of guidance documents that will be used for data validation. A specific set of steps should have been listed for the data validation process. The process for data verification should have been added to the QAA if different from those in the QAPjP. This issue must be addressed prior to conducting field work.

Section 3.9: Data Reduction, Validation, and Reporting: The necessary information concerning field data validation is referenced among several documents but not detailed in any document. This section states "field data validation shall be performed as specified in Section 3.3.3.2 of the QA Project Plan." The cited section of the site-wide QA Project Plan (found on page 23 of the QA Project Plan) notes that field data will be validated on two different levels. The first level of validation involves periodic surveillance during the sample collection activity as specified "by following Rocky Flats Plant standard operating procedures (SOPs) for data validation." (The second validation level involves only a review of the data to ensure correct codes and units were used.) The coordination of the workplan with the sitewide QAPJP and SOP is necessary prior to EPA approval of this workplan.

The following example illustrates the continuing circular nature of the references involving field data validation. A common criterion used in the validation of field data is whether an adequate number of quality assurance/quality control (QA/QC) samples were taken in the field. QA/QC samples include field duplicates, equipment rinsates, trip blanks, field blanks, and matrix spike/matrix spike duplicates. The appropriate SOP for this activity is SOP 1.13 "Containerizing, preserving, handling, and shipping of soil and water samples." Section 7.0 of SOP 1.13 (Quality Assurance/Quality Control Samples, page 18) includes descriptions of the types of QA/QC samples discussed above. However, the frequency for collection of these samples is "specified in the project specific field sampling plan (FSP)." The FSP (Section 5.0 of the Phase III work plan for OU 1) does not, however, contain any information regarding the frequency of collection of field QA/QC samples. Although criteria for validation of field data are referenced in this QAA, the site-wide QA Project Plan, the sample storage SOP, and the FSP, the necessary QA/QC sample frequency information is missing.

Other items that should have been considered (in the site-wide QA Project Plan, in the QAA, or in the FSP) include collection of sufficient sample volume, adherence to proper preservation techniques, and adherence to chain-of-custody procedures. Information regarding the frequency of collection of QA/QC samples would be appropriately placed in the QAA. Other items related to validation of field data would be most useful as part of the site-wide QA Project Plan or the SOP.

Section 5.0 Instructions, Procedures, and Drawings: New procedures will need approval by EPA.

Section 6.0 Document Control: Documents relating to the OU 1 IM/IRA should have been added.

Section 11.0: This discussion of test control requirements did not include specific information on the QAA but references the Site-Wide QAPjP. The Site-Wide QAPjP references the QAA and the workplan/FSP; and the workplan/FSP does not contain the cited information concerning test control requirements. This must be rectified to EPA satisfaction before approval will be granted for this workplan.